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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/762,969	01/21/2004	Chok W. Ho	LAM1P152D1/P0692D	6351
22434	7590	04/18/2006	EXAMINER	
BEYER WEAVER & THOMAS LLP			VINH, LAN	
P.O. BOX 70250			ART UNIT	
OAKLAND, CA 94612-0250			PAPER NUMBER	
			1765	

DATE MAILED: 04/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/762,969

Applicant(s)

HO ET AL.

Examiner

Lan Vinh

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 March 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 17,18 and 22-39 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 37 is/are allowed.
- 6) ☒ Claim(s) 17,18,22,29-31 and 36,38 is/are rejected.
- 7) ☒ Claim(s) 23-28,32-35 and 39 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 040706.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____.

DETAILED ACTION

Response to Amendment/Argument

1. Applicant's arguments, see page 8 of the response, filed 3/6/2006, with respect to the rejection(s) of claim 37 under 35 USC 102(e) based on the Hu (US 6,316,354) reference have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, Applicant's arguments with respect to the rejection(s) of claims 17-18, 22, 31 under 37 under 35 USC 102(e) based on the Hu (US 6,316,354) reference have been fully have been fully considered but they are not persuasive.

The applicants argue that Hu does not teach generating an NH₃ and then selectively etch the low-k dielectric layer with respect to the hardmask as recited in claims 17 and 31. This argument is unpersuasive because it does not commensurate with the scope of claims 17 and 31 since claims 17 and 31 do not explicitly recite the sequential step of generating an NH₃ and then selectively etch the low-k dielectric layer with respect to the hardmask.

The applicants also argue that Hu provides a different structure from the claimed invention because in Hu the via have already been etched in Hu and the stripping process does not damage the sidewalls of the vias in Hu. This argument is unpersuasive because as described in paragraph 3 below, Hu discloses providing a structure including: a hard mask 20 over the silicon oxide/organic low-k dielectric layer 14, a patterned photoresist layer 30 over the hard mask 20, the wafer/substrate is placed in an etching chamber, an etchant gas comprising NH₃ is flown into the chamber, a plasma from NH₃ is generated, the layer 14/organic low-k dielectric layer

Art Unit: 1765

is selectively etched with respect to the hard mask 20, the photoresist 30 is removed /stripped during the selective etching, as required in claims 17 and 31

The applicants further argue that Hu does not etch the low k dielectric with NH₃ plasma as recited in claims 17 and 31. This argument is unpersuasive because it does not commensurate with the scope of claims 17 and 31 since claims 17 and 31 do not explicitly recite etching the low k dielectric with NH₃. In fact, claim 17 requires a step of "selectively etching the organic low-k dielectric layer with respect to the hard mask", the language of "which etches the organic dielectric layer.....photoresist layer" does not recite a positive step because it is functional claim language.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

3. Claims 17-18, 22, 29-31, 36, 38 are rejected under 35 U.S.C. 102(e) as being anticipated by Hu (US 6,316,354)

Hu discloses a method for forming an integrated circuit formed from a low-k dielectric over a substrate. The method comprises the steps of:

placing a hard mask 20 over the silicon oxide/organic low-k dielectric layer 14 (col 4, lines 1-2)

Art Unit: 1765

forming a patterned photoresist layer 30 over the hard mask 20 (col 4, lines 26-28, fig.

1)

placing the wafer/substrate in an etching chamber (col 5, lines 58-60)

flowing an etchant gas comprising NH₃ (col 5, lines 60-63), Hu discloses that the NH₃ has a flow rate of 400 sccm (col 5, lines 60-62), which overlaps the claimed range of 5-1500 sccm

generating a plasma from NH₃ to strip resist (col 5, lines 1-10, fig. 4)

selectively etching the layer 14/organic low-k dielectric layer with respect to the hard mask 20 (col 4, lines 17-25, fig. 2 shows that portion of layer 14 removed during etching is larger than portion of hardmask layer 20 removed during etching)

removing the photoresist 30 when exposing the substrate to the NH₃ plasma (col 4, lines 45-52, fig. 2), which reads on simultaneously stripping the photoresist layer during selective etching of the low k dielectric layer

Since Hu discloses the same method using the same structure and materials (low-k dielectric, hardmask, NH₃ gas) as the claimed invention, under the principle of inherency, Hu plasma from NH₃ would have inherently been capable to selectively etch the organic low-k dielectric layer with respect to the hardmask. It is also noted that "where functional language is used in the process, the burden shifts to the applicant to establish that the reference does not inherently function in the manner required by the claims. Ex parte Bylund 217 USPQ 492 (PO BdPatApp 1981)"

The limitations of claims 18, 30 have been discussed above

Art Unit: 1765

Regarding claims 22, Hu discloses applying power from about 100 Watts to the chamber (col 4, lines 64-65)

Regarding claims 29, 36, fig. 2 shows that the resist 30 is completely removed after the etching step

Regarding claim 38, fig. 2 of Hu shows that vias/features are etched into the low-k dielectric layer 14

Allowable Subject Matter

4. Claims 23-28, 32-35, 39 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims

The following is a statement of reasons for allowance/for the indication of allowable subject matter:

Regarding claim 23, the cited prior art of record fails to disclose or suggest an integrated circuit formed from the step of "placing an etch stop....; placing a second organic dielectrichardmask.", in combination with the rest of the limitations of claim 23

Regarding claim 32, the cited prior art of record fails to disclose or suggest an integrated circuit formed from the method comprises the step of "providing CHF₃ while providing the etching gas comprising NH₃", in combination with the rest of the limitations of claim 32

Claim 37 allowed

Art Unit: 1765

Regarding claims 37, 39, the cited prior art of record fails to disclose or suggest an integrated circuit formed from the method comprises the step of "etching features into the organic dielectric layer using the plasma from the NH₃", in combination with the rest of the limitations of claims 37, 39

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Chung et al (US 6,184,142) discloses using a low-k organic silicon oxide film (col 1, lines 56-57)

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Conclusion

Art Unit: 1765

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is 571 272 1471.

The examiner can normally be reached on M-F 8:30-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571 272 1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



LV

April 16, 2006